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Issue Article

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FORMATION OF STUDENTS' SUBJECT COMPETENCIES IN THE FIELD OF PHYSICS WITH THE HELP OF VIRTUAL LABORATORY WORK

Abstract: *This article analyzes the practical and theoretical significance of virtual laboratory work in the formation of students' competencies in physics. The need to improve the methodology of using virtual laboratory work in physics lessons based on modern requirements is methodologically justified.*

Key words: *physics course, unified physical image of the world, scientific worldview, virtual laboratory work, competencies, physical phenomena, photoelectric effect, process modeling.*

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Introduction

The physics course taught in academic lyceums is the main component of the natural sciences. It makes a great contribution to solving the problems of general education, ensures the formation of a unified physical image of the world, a scientific worldview, the development of intellectual and creative abilities, instilling values of the direction, preparation for life in modern society. Physics as the science of the most general laws of nature, acting as an academic subject in academic lyceums, makes a significant contribution to the system of knowledge about the surrounding world. In academic lyceums, the physics course is a system-forming one for natural science subjects, since physical laws underlie the content of chemistry, biology, geography and astronomy courses.

The study of physics is necessary not only for mastering the basics of one of the natural sciences, which is a component of modern culture. Without knowledge of physics in its historical development, a person will not understand the history of the formation of other components of modern culture. In order to solve the problems of forming the foundations of a scientific worldview, the development of intellectual abilities and cognitive interests of academic lyceums in the process of studying physics, the main attention should be paid not to the transfer of the sum of ready-made knowledge, but to familiarity with the methods of scientific knowledge of the surrounding world, the formulation of problems requiring students to actively independently solve them.

Currently, computer information systems are of great interest in such fields of activity as education, science, technology and technology. Moreover, the continuous development of science, technology and technology leads to the emergence of new information systems, as well as to the development and improvement of existing ones. As for education, the introduction of new technologies, as well as comprehensive modernization are the main issues that are given special attention not only in Uzbekistan, but also around the world. It should be borne in mind that the introduction of information technologies into the educational process will be justified if they effectively complement existing learning technologies or have additional advantages over traditional forms of education. For example, the use of virtual laboratory work in teaching physics allows you to make laboratory work more lively and interesting, while improving the quality of education.

Main part.

Since physics is the basis of scientific and technological progress, the importance of physical knowledge and the role of physics are continuously increasing. Methods and means of physical cognition are in demand in almost all areas of human activity. The application of physical knowledge and skills is necessary for every person to solve practical problems of everyday life.

Virtual laboratory work - advantages and disadvantages.

Virtual laboratory work is a software and hardware complex that allows conducting experiments without direct contact with a real installation or in its complete absence [3].

At the same time, such concepts as "virtual laboratory" and "virtual remote laboratory" should be distinguished. The basis of a virtual laboratory is a computer program or a related set of programs that perform computer modeling of certain processes [4]. A virtual remote laboratory is a network organizational structure of several groups of scientists who belong to various scientific centers and are interconnected by mutually beneficial cooperation relations, thanks to the Internet [5].

Compared to traditional laboratory work, virtual laboratory work has a number of advantages.

Firstly, there is no need to buy expensive equipment and dangerous radioactive materials. For example, specially equipped laboratories are required for laboratory work on quantum or atomic or nuclear physics. Virtual laboratory work allows us to study such phenomena as the photoelectric effect, Rutherford's experience in scattering alpha particles, determination of the crystal lattice period by electron diffraction, the study of gas laws, nuclear reactors, etc.

Secondly, it becomes possible to simulate processes that are not available in the laboratory. In particular, most of the classical laboratory works on molecular physics and thermodynamics are closed systems, at the output of which a certain set of electrical quantities is measured, from which the desired quantities are then calculated using the equations of electrodynamics and thermodynamics. All molecular kinetic and thermodynamic processes occurring in the experiment remain inaccessible to observation. In the course of performing virtual laboratory work on these sections of physics, students can use animated models to observe dynamic illustrations of the studied physical and chemical phenomena and processes that are not available for observation in a real experiment, while simultaneously observing the graphical construction of the corresponding dependences of physical quantities.

Thirdly, virtual laboratory work has a more visual visualization of physical or chemical processes compared to traditional laboratory work. For example, it becomes possible to study in more detail and visually such physical processes as the movement of charged particles that create an electric current or the principle of operation of the p-p junction. It is also possible to penetrate into processes that occur in fractions of a second or last for several years, for example, the study of the movement of planets in the gravitational field of the central body.

Another advantage of virtual laboratory work in comparison with traditional ones is security. In particular, the use of virtual laboratory work in cases where there is work with high voltage or dangerous chemical reagents.

However, virtual laboratory work also has disadvantages. The main one is the absence of direct contact with the object of study, instruments, equipment. It is absolutely impossible to train a specialist who has seen a technical object only on a computer screen. Or are there likely to be people willing to go to a surgeon who previously practiced only on a computer. Therefore, the most reasonable solution is to combine the introduction of traditional and virtual laboratory work in the educational process, taking into account their advantages and disadvantages.

The use of virtual laboratory work in the study of physics.

Deep assimilation of physics is possible by studying the theory and in the process of its application to solve various computational, qualitative and experimental problems. If the reader gets acquainted with theoretical issues in lecture classes, then theory is also applied in laboratory classes, and, in addition, practical skills and abilities are formed in carrying out physical measurements, in processing and presenting results.

High-quality performance and successful protection of the results of laboratory work by readers are impossible without independent preliminary preparation for laboratory classes. In the process of preparing for the next lesson, first of all, it is necessary to study the description of the work performed according to this manual. However, it is impossible to limit ourselves only to this, since a theoretical introduction to each work cannot be considered as a sufficient minimum for a deep understanding of the physical foundations of the work. Therefore, it is necessary to read the material corresponding to the topic of the work according to the textbook for each work. It is impossible to start work without mastering its basic theoretical provisions, without realizing the logic of the measurement procedure, without knowing how to use measuring instruments related to this work. When starting work, the reader should firmly understand the purpose of this work, the general work plan, i.e. the sequence of actions during measurements. This is the main reason for returning to work when interviewing a teacher at the beginning of a lesson.

The virtual computer laboratory contains instructions and methodological guidelines for the performance of works constructed uniformly in the following form: the purpose of the work, theoretical material, experimental setup, the procedure for performing the work, report. In addition, each laboratory work contains a test that includes an assessment of the basic knowledge necessary for the successful completion of the work, and a final test that aims to control the residual knowledge based on the results of laboratory work.

You can use virtualabs both on-line and off-line. Let 's briefly focus on some of them:

1. Virtulab.Net This is one of the developed specialized portals dedicated to virtual educational laboratories. The site offers educational interactive works that allow students to conduct virtual experiments in physics, chemistry, biology, ecology and other subjects. This is a free on-line resource.

2. Virtual physics laboratory for schoolchildren. The virtual laboratory contains a set of programs for the school physics course and is intended for use by teachers in physics lessons, as well as by students to perform tasks using computers in the classroom and at home, and can also be used in preparation for the UNT. This is a paid resource.

3. Interactive laboratory work on physics and other subjects, the resource is located on the website of the Unified Collection of Data Centers. This educational resource can be used both on-line and off-line. This is a free resource.

4. A series of discs released by the publishing house "Bustard": Laboratory work in physics for grades 7-11.

Moreover, the work of students with computer models is extremely useful, since students can set up numerous virtual experiments and even conduct small studies.

But virtual laboratory work also has undeniable advantages, since it allows conducting computer laboratory experiments in physics for cases when setting up a real experiment is difficult or it is necessary to instantly process the results obtained.

Conclusion.

I have presented you a small list of virtual educational resources. It should be noted that computer laboratory installations in virtual laboratories, as a rule, are a computer model of a real experimental installation. The performance of experimental studies is a direct analogue of an experiment on a real physical installation.

Summing up all of the above, we can say that virtual laboratories can be used both in the classroom and in self-preparation for classes, they allow you to deeper understand the laws of physics and penetrate into the essence of physical phenomena. We must not forget that in most cases this is a clearly programmed process.

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